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Chipless RFID: Solutions for enriching coding capacity, increasing reading range and mitigating clutter

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Recently, Chipless RFID system has attracted tremendous potential in the field of item identification where the cost is the main concern. Further, it fills the gap where the chipped RFID solution couldn't be utilized due to the chip presence which necessitates operating environment conditions and mechanical robustness. In this regard, Chipless RFID tags are playing significant role in the system. This presentation is introducing solutions of the efforts that have been spent so far to enable the technology deployment in the large scale. Moreover, it proposes novel solutions that will be published in the near future.

Content: First, the concept of encoding data without having RFID chip will be explained. Afterwards, solutions to maximize the coding capacity by exploiting the resonance properties and backscattering polarization planes are introduced. Then, the clutter mitigation solutions are explored in order to enhance the detection of the encoded data. Two main solutions are presented for clutter mitigation which are: (1) Directive pencil beam reader antennas, like Reflect Array; (2) Having the tag response in different polarization plane than the interrogation plane. After that the clutter suppression is enabled by introducing nonlinearity in the tag response. Lastly, solutions for increasing the reading range will be discussed.

Findings: Coding capacity up to 100 bits within encoding band of 2 GHz is achieved. Besides, reading range beyond the chipped RFID solution could be achieved.

Conclusion & Significance: Chipless RFID opens the door to new applications like indoor localization with centimeter accuracy which couldn't be achieved with the chipped RFID counterpart. Accordingly, the technology will be massively employed in the upcoming technological trends; like IoT and 6G.

Biography

Maher Khaliel received the B.Sc. and the M.Sc. degrees in electrical engineering from Benha University in 2007 and 2012, respectively, and the Ph.D. degree in electrical engineering from the Institute of Digital Signal Processing, Duisburg-Essen University in 2016. His Ph.D. research was centered around innovating chinless RFID tags, developing the reader antenna, and integrating innovative approaches to advance the reader functionality. He has published a number of journal/conference papers, nominated for the best student paper award at European Conference on Antennas and Propagation (EUCAP 2015 and 2017), and was a co-recipient of several awards, including the best paper award of the 15th IEEE International Conference on Communications Systems (ICCS 2016). Maher is currently a senior developer at ID4us GmbH, Duisburg, Germany and post-doctoral researcher at the institute of Digital Signal Processing, Duisburg-Essen University.